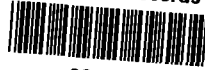


Public Health Assessment for

EPA Region 5 Records Ctr.



321394



PUBLIC HEALTH ASSESSMENT

PFIZER INCORPORATED

EAST ST. LOUIS, ST. CLAIR COUNTY, ILLINOIS

NOVEMBER 24, 1999

Initial
Release

U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry



Comment Period Ends:
JANUARY 4, 1999



THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104 (i) (7) (A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risk assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, ATSDR has conducted this preliminary health assessment on the data in the site summary form. Additional public health assessments may be conducted for this site as more information becomes available to ATSDR.

The conclusions and recommendations presented in this public health assessment are the results of site-specific analyses and are not to be cited or quoted in other evaluations or public health assessments.

PUBLIC HEALTH ASSESSMENT

PFIZER INCORPORATED

EAST ST. LOUIS, ST. CLAIR COUNTY, ILLINOIS

CERCLIS NO. ILD006317119

Prepared by:

**Illinois Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry**

FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations - the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E-56), Atlanta, GA 30333.

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SUMMARY

Residents in the neighborhood near the Pfizer site in East St. Louis, St. Clair County, Illinois, requested that the Illinois Department of Public Health (IDPH) conduct a public health assessment of the site. Residents are concerned that they are being exposed to site-related contaminants from the air and soil. From reviewing available data, IDPH concludes that the Pfizer site does not pose a public health hazard.

The main health issue is off-site exposure to airborne contaminants from the site. Dust is currently released and has also been released in the past. The most notable release is red, iron oxide pigment, and soils surrounding the site have a reddish stain. The pigment settles on homes and cars and is reportedly difficult to clean from these surfaces. Another concern of area residents is exposure to contaminants in the soil.

The chemicals of interest from the site are arsenic, barium, cadmium, and polycyclic aromatic hydrocarbons. IDPH estimated exposure to soil contaminants for workers on the site and for children and adults off the site. Those soil exposure estimates indicate that no adverse health effects would be expected.

Additional data should be collected to more fully characterize exposure to dust in air and off-site soils. IDPH will collect additional soil samples around the Pfizer site and measure dust levels in ambient air at the site. Analysis of those samples is expected to more accurately identify any exposures that might affect nearby residents.

PURPOSE AND HEALTH ISSUES

Citizens in the neighborhood near Pfizer, Inc., requested that the Illinois Department of Public Health (IDPH) conduct a health assessment to determine whether the site poses a health hazard to nearby residents. A public meeting was held to receive comments and citizens' concerns regarding the site. In addition, volunteers went door-to-door gathering information from area residents concerning Pfizer.

The primary health issue is off-site exposure to contaminants in the air that migrate from the site. The most notable release is red, iron oxide pigment. Airborne pigment has been noted and raises concerns regarding inhalation exposures to the dust, particularly in the past. The soils surrounding the site have a reddish stain. The pigment settles on homes and cars and is reportedly difficult to clean from these surfaces. Secondary concerns include dermal contact with dust and contaminated surfaces, and ingestion of soil and vegetables grown in local soils.

BACKGROUND

Site History and Location

Pfizer, Inc., began manufacturing pigments at 2001 Lynch Avenue, East St. Louis, St. Clair County, Illinois in 1941. The site has changed ownership twice since 1941 and has been Elementis Pigment, Inc. since January 1, 1998 (1).

The site is on about 40 acres and is bordered by railroad tracks on the north, east, and west, and Lynch Avenue is on the south (Figure 1). A residential area is within 100 feet of the western boundary of the site. The southern, eastern, and northern sections have vacant land directly adjacent to them; however, residential areas are within 500 feet of the northern and eastern site boundaries. A park and baseball fields are to the south and east of the site. Jefferson Elementary school is about 0.25 miles northeast of the site.

A fence surrounds the site, and guarded gates are in the southwest corner of the site (2). The southern portion of the site is paved and contains buildings. The northwest portion is not paved and contains buildings and waste piles of what appears to be asphalt and construction debris. Iron waste and slag materials have also been observed in this area. Ore and coal piles are known to have been stored in the northern portion of the property (3).

Manufacturing Processes at the Facility

Products manufactured at this facility are inorganic pigments, including red and yellow iron oxides, barium oxide, and magnetic pigments. Substances used on the site and listed in an Illinois Environmental Protection Agency (IEPA) document included ammonia, ferrous chloride, ferrous sulfate, hydrochloric acid, muriatic acid, sodium dichromate, sodium hydroxide, sulfuric acid, barium hydrate, barium hydroxide, and barium peroxide (4).

Primary production at the site is iron oxide pigments. The pigments are produced by placing scrap iron and hydrochloric or sulfuric acid (pickle liquor) into tanks. The pickle liquor is obtained from local steel industries (4). After the acid and iron are heated in tanks for 18 to 24 hours, the solids are removed from the ferrous sulfate or ferrous chloride solutions. The solids are analyzed to determine whether they are hazardous and then are sent to an appropriate landfill. The iron compounds are precipitated out of solution, and the remaining solution is neutralized and discharged to the sanitary sewer (4). The iron oxides produced by this process are then dried, milled, and packed for shipping.

Natural Resource Use

Surface water from the site drains into the sanitary sewer or is discharged to Schoenberger Creek. Surface water runoff from the paved portion of the facility is discharged to the sanitary sewers in either southwestern or southeastern corners of the property. Surface water runoff from the north

and east portion of the property collects in a low area known as Pickens Pond, which is on the east side of the property. Wastewater and sludge from the on-site wastewater treatment plant are also discharged to Pickens Pond. Release of water from the northern section of the property to Schoenberger Creek is permitted through the storm sewer. Water released into the creek from this pipe has been observed to be orange, suggesting the presence of iron oxide.

Groundwater, provided by three on-site wells, is used as non-contact cooling water at the site (5). This water is then pumped to a discharge point on the east side of the property (1). This water is eventually discharged to Schoenberger Creek via the underground discharge pipe.

Environmental Sampling

Environmental samples were collected on December 2 and 3, 1997, as part of the IEPA Site Team Evaluation Prioritization inspection. Soil, sediment, surface water, and groundwater samples have been collected for the site (Figure 2). Six on-site soil samples and three off-site soil samples were collected from the surface to a depth of eight inches. One off-site soil sample, X101, was collected as a background sample. Two sediment samples were collected from Schoenberger Creek, one upstream and one downstream of the discharge from Pfizer. Three groundwater samples were collected from two on-site locations. Three surface-water samples were collected, one from the site from Pickens Pond and two from Schoenberger Creek off the site. Creek water samples were collected from the same locations as sediment samples.

No air samples are known to have been collected near the Pfizer site. IEPA has an air-monitoring station in East St. Louis but not within one-half mile of the site. In 1994 and 1995, IDPH collected air samples from five locations in E. St. Louis, but none of these locations was within one mile of Pfizer.

Site Visit

IDPH has visited the site on several occasions, most recently on August 26, 1999. Conditions at the facility remain as described earlier. A fence surrounding the site and guarded gates in the southwest corner of the site assure that access is limited.

DISCUSSION

Contaminants of Interest

Samples collected by IEPA were analyzed for chemicals listed by the U.S. Environmental Protection Agency (USEPA) as target compounds at hazardous waste sites. IDPH compared the results of each soil sample with the appropriate screening comparison value used to select contaminants for further evaluation for carcinogenic and non-carcinogenic health effects. Chemicals found at levels greater than comparison values or those for which no comparison

values exist were selected for further evaluation (Table 1). A discussion of each comparison value used is found in Attachment 1.

The chemicals of interest at Pfizer are arsenic, barium, cadmium, iron, and polycyclic aromatic hydrocarbons (PAHs). Exposure to a chemical which level exceeds a comparison value does not necessarily mean that adverse health effects will result. The potential for exposed persons to experience adverse health effects depends on:

- ▶ how much of each chemical a person is exposed to,
- ▶ how long a person is exposed, and
- ▶ the health condition of the exposed person.

IDPH recognizes that the number of soil samples collected from on and off the site is limited – only two soil samples and one sediment sample were collected off the site in potentially impacted areas. Samples collected from yards and areas where children are likely to play would more accurately represent exposure for children. Other site-related chemicals detected in on- and off-site soil samples may warrant further investigation. The location of the sediment sample is so far removed from the site that contents of the sample may represent contamination from other sources.

Exposure Pathways

People can only be affected by a chemical if they contact it through an exposure pathway at a sufficient concentration to cause a toxic effect. That requires a source of exposure, an environmental transport medium, a point of exposure, a route of exposure, and an exposed population. A pathway is complete if all of its components are present and if people were exposed in the past, are currently exposed, or will be exposed in the future. If parts of a pathway are absent, data are insufficient to decide whether it is complete, or exposure may occur at some time (past, present, future), then it is a potential pathway. If part of a pathway is not present and will never exist, the pathway is incomplete and can be eliminated from further consideration.

The completed exposure pathways for this site are shown in Table 2. Completed exposure pathways for the site-related chemicals include on-site and off-site surface soil, off-site sediments, ambient air, and the waste piles. Potential exposure pathways are shown in Table 3.

Groundwater samples had levels of manganese and thallium that exceeded drinking water comparison values. In addition, iron levels were greater than the U.S. Environmental Protection Agency secondary drinking water standard of 0.3 milligrams per liter. Secondary standards are non-enforceable guidelines for chemicals that may cause staining or affect taste. The four groundwater wells on the site are used strictly for non-contact cooling water. Residents of East St. Louis use municipal water. Exposure of workers and residents could occur if the waste piles were remediated improperly.

A possible source of exposure to contaminants is at or near the discharge of the storm sewer into Schoenberger Creek. The levels of iron and manganese are elevated at the discharge points, but consumption of creek water is highly unlikely. The creek is in an area that has few residents and is not readily accessible. Surface water on the site was not evaluated because the site is fenced and a guard is posted at the gate. Workers would not be likely to contact the on-site surface water.

Toxicological Evaluation

Children are a sensitive sub-population, so special consideration is given to potential exposures to children in our toxicological evaluation. To estimate exposure, IDPH assumed that children and adults off the site and workers on the site could be exposed to chemicals of interest. IDPH assumed that residents could be exposed to the highest levels of chemicals of interest in off-site surface soil and sediments 10 months per year by ingestion, dermal contact, and inhalation. Workers could be exposed to chemicals on the site 5 days per week, 50 weeks per year.

The estimated exposure doses were compared with health guidelines for non-cancer health effects. Cancer risks were estimated for those chemicals that are known or suspected carcinogens. The cancer risk for the PAHs was calculated by converting each of the suspected carcinogenic PAHs to their equivalent concentration of benzo(a)pyrene. These equivalents were then added together and used to estimate health risks for exposure to PAHs.

From these scenarios, IDPH found no non-cancer health hazards and no apparent increased cancer risk due to exposure to on-site and off-site contamination. The soils on and off the site have been visibly contaminated with iron oxide pigments from Pfizer, but the iron itself is not a health hazard.

IDPH did not evaluate exposure to airborne dust because of a lack of sampling data. The primary hazard for exposure to dust relates to the size and concentration of respirable particles. Additional data need to be collected to determine the concentration of dust in the air.

COMMUNITY HEALTH CONCERNS

Area residents petitioned this public health assessment because of their concern about exposure to site-related chemicals. IDPH attended a public meeting held October 14, 1998, by Project Hope and the University of Missouri St. Louis Environmental Justice Initiative to explain the health assessment process and to obtain public health concerns about the site. Additional community health concerns were collected by volunteers. About 40 persons voiced their concerns regarding environmental contamination in the neighborhoods surrounding Pfizer. Some concerns included issues that were not related to Pfizer, such as drinking water.

Community health concerns identified from the public meeting and written comments received after the meeting included:

- 1) The airborne dust settles out of the air onto cars and into our houses. Is exposure to airborne dust a health hazard?

The red dust that is in the air is from iron oxide pigments produced at the plant. Dust of this composition or chemical makeup is not toxic through inhalation. The health effects associated with breathing the dust would most likely be the same as those for breathing other dust particles of similar size and would depend on how small the particles are and how deep they are taken into the lung. Currently, neither the amount of dust in the air nor its particle size is known.

- 2) We smell odors coming from the site. Are these harmful to my health?

IDPH does not know the source of the odors coming from the site. At one time, coal-fired boilers produced smoke and presumably odors. These were replaced with natural gas-fired boilers, which would not be expected to produce noticeable odors.

- 3) The soil around the site is red. Aren't we being exposed to these contaminants in soil?

The soil surrounding the site is contaminated with iron oxide pigments from years of operations at Pfizer. The iron levels in the soil on and off the site are greater than background. No health guidelines exist for iron in soil, but our bodies require a certain amount of iron to remain healthy. The soil near the site also contains lower levels of inorganic chemicals such as barium, cadmium, and arsenic. Soil samples will be collected to determine whether they are present in residential soil.

- 4) The drinking water sometimes has an odor to it. Is it safe to drink?

The source of the odors in the drinking water is not known. All area residents use the municipal water supply for East St. Louis. Public water supplies are required to monitor their water for specific contaminants. If the water contained contamination at levels above standards, the water company would have to let you know. The municipal water company should be contacted regarding odor, taste, and discoloration problems with the drinking water.

CONCLUSIONS

IDPH concludes that the Pfizer, Inc., site in East St. Louis, Illinois, poses no apparent public health hazard. This conclusion is based on the fact that estimated exposure to the highest levels of contaminants detected during limited environmental sampling would not cause adverse health effects. Workers and residents living in neighborhoods adjacent to the site are being exposed to airborne particulates from the site, but no air data exist to evaluate the exposure.

RECOMMENDATIONS AND PUBLIC HEALTH ACTIONS

IDPH recommends to:

- 1) Collect more soil samples from residential yards and areas near the site where children play. IDPH will collect about 40 soil samples from neighborhoods and play areas near the Pfizer site. The samples will be analyzed for arsenic, barium, and cadmium.
- 2) Test levels of dust in the air in neighborhoods during periods when dust levels are expected to be at their highest. IDPH will collect air measurements to determine the amount of dust in the air when dust levels are expected to be the highest.
- 3) Contact the IEPA Bureau of Air to report odors coming from Pfizer. This recommendation is intended for residents.

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REFERENCES

- 1) Letter from Roger Rader, Harcross Pigments, to IEPA. December 22, 1997
- 2) Letter from Roger Rader, Pfizer Plant Manager, to Larry Estep, IEPA. August 5, 1987.
- 3) IEPA. Draft: April 1998 Site Team Evaluation Prioritization Report. 1999.
- 4) IEPA. Preliminary Site Assessment for Pfizer Chemical. 1984.
- 5) Hazardous Waste Permit Application, Pfizer Chemical. 1981.
- 6) Conversation with Jerome King, USEPA, Gateway Coordinator, October, 14, 1998.
- 7) Agency for Toxic Substances and Disease Registry. Public Health Assessment Guidance Manual. Atlanta, Ga., 1992.
- 8) Agency for Toxic Substances and Disease Registry. Toxicological Profile for Arsenic (Draft). Atlanta, Ga., 1991
- 9) Agency for Toxic Substances and Disease Registry. Toxicological Profile for Barium. Atlanta, Ga., 1992.
- 10) Agency for Toxic Substances and Disease Registry. Toxicological Profile for Cadmium (Draft). Atlanta, Ga., 1991.
- 11) Agency for Toxic Substances and Disease Registry. Toxicological Profile for PAHs. Atlanta, Ga., 1995.

Pfizer, Inc.

Initial Release

FIGURES

Approximate Location of Pfizer, Inc.

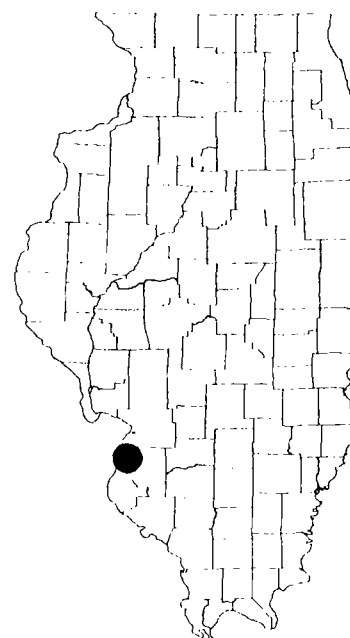
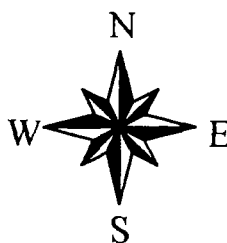
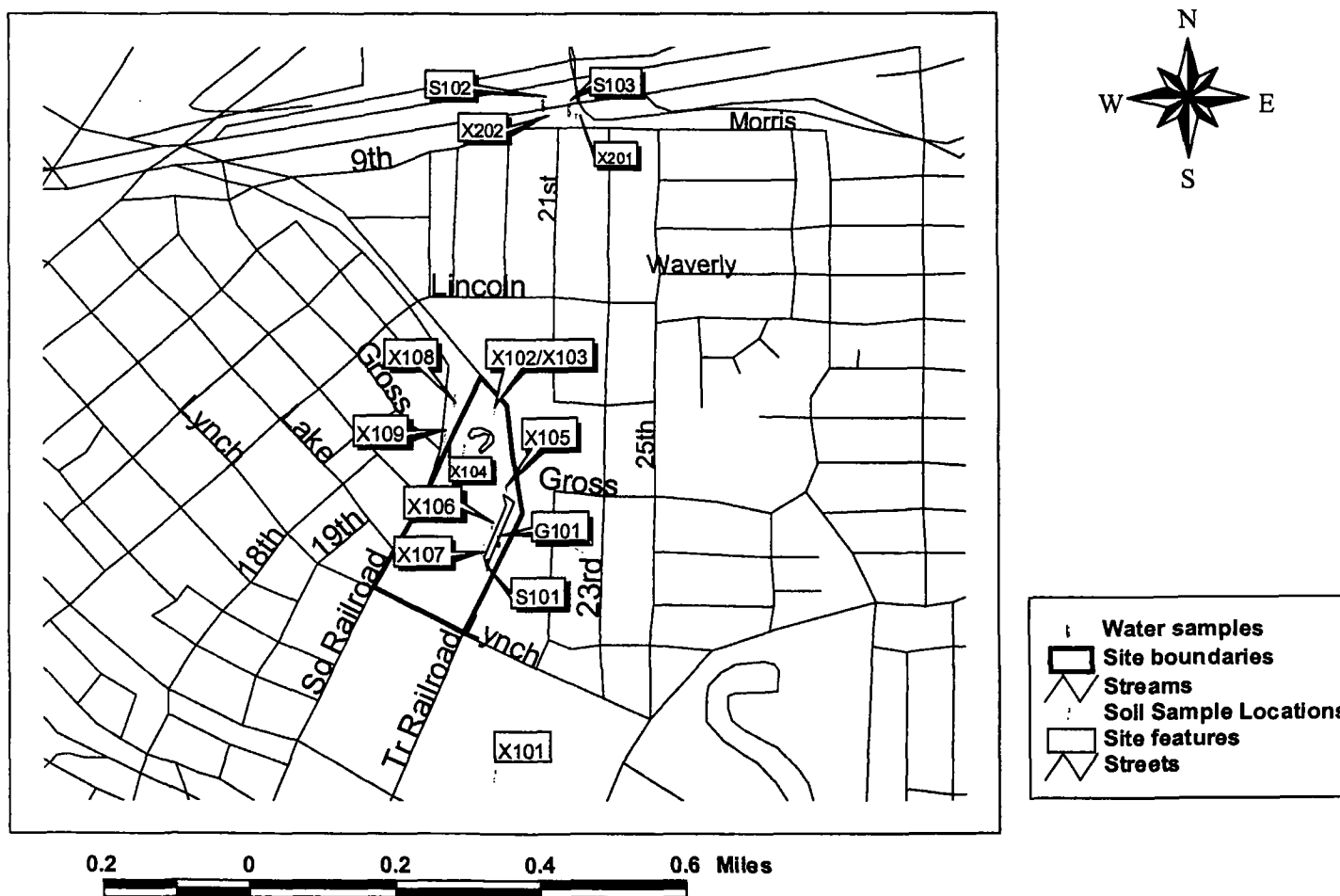


FIGURE 2

Sample Location Map



Source:

TABLES

TABLE 1. Chemicals of Interest in Soil and Sediment at Pfizer, Inc. (concentrations in parts per million)

Sampling Point	Soil									Sediment		Comparison Values	
	Off-site Background	On the site						Off the site		Off the site		Value	Source
	X101	X102	X103	X104	X105	X106	X107	X108	X109	X201	X202		
SEMIVOLATILES													
Benz(a)anthracene	0.071J	ND	ND	0.23J	1.2J	0.360J	0.970J	ND	0.820J	ND	4.300J	NV	NV
Chrysene	0.099J	ND	ND	0.30J	1.3J	0.380J	1.000J	ND	1.000J	ND	4.500J	NV	NV
Benzo(b)fluoranthene	0.150J	ND	ND	0.26J	1.7J	0.540J	1.300J	ND	1.400J	ND	4.400J	NV	NV
Benzo(k)fluoranthene	0.048J	ND	ND	ND	0.73J	0.340J	0.360J	ND	ND	ND	2.200J	NV	NV
Benzo(a)pyrene	0.071J	ND	ND	ND	0.98J	0.340J	0.830J	ND	0.760J	ND	3.100J	0.1	CREG
Indeno(1,2,3-cd)pyrene	0.061J	ND	ND	ND	0.74J	0.330J	0.440J	ND	ND	ND	1.700J	NV	NV
Benzo(g,h,i)perylene	0.085J	ND	ND	ND	0.53J	0.320J	0.370J	ND	ND	ND	1.400J	NV	NV
INORGANICS													
Arsenic	3.9	43.6	41.9	10.2	5.6	7.2	7.4	26.7	1.4	3.3	6.9	20	CEMEG
Barium	316	3040	2550	2580	3730	16400	6020	7900	9890	197	387	4000	RMEG
Cadmium	1.7	4.8	4.5	8.1	5.5	15.4	4.7	8.3	14.1	2.2	9.3	10	CEMEG
Iron	18200	NT	NT	199000	NT	NT	70200	803000	NT	18900	43900	NV	NV

NV - No comparison value listed for this chemical

ND - Not detected

NT - Not tested

J - Estimated Value

blank boxes indicate that the level of the chemical was less than the laboratory detection limit

CREG - Cancer Risk Evaluation Guideline (for children)

CEMEG - Chronic Environmental Media Evaluation Guideline (for children)

RMEG - Reference Dose Media Evaluation Guideline (for children)

TABLE 2. Completed exposure pathways.

Pathway Name	Source	Medium	Exposure Point	Exposure Route	Receptor Population	Time of Exposure	Exposure Activities	Estimated Number Exposed	Chemicals
On-site surface soil	Waste piles Site operations On-site soil	Surface soil	On-site soil	Ingestion Inhalation	Employees and visitors	Past Present Future	Contacting contaminated soil	50	Table 1
Off-site surface soil	Waste piles Site operations On-site soil Off-site soil	Surface soil	Yards Play-grounds	Ingestion Inhalation	Residents Playground users	Past Present Future	Playing in & working with contaminated soil	800	Table 1
Sediments	Contaminated Soil	Sediments	Children playing in Schoenberger Creek	Ingestion	Children ingesting sediments from Schoenberger Creek	Past Present Future	Playing in creek sediments	30	Table 1
Ambient Air	Waste piles Site operations Contaminated soil	Air	Residents closest to the site	Inhalation	Nearby residents	Past Present Future	Breathing	1000	Table 1
Waste Piles	Waste piles	Waste pile	Employees	Ingestion Inhalation	On-site Workers	Past Present Future	Working with the waste piles	10	Table 1

TABLE 3. Potential exposure pathways.

Pathway Name:	Source	Medium	Exposure Point	Exposure Route	Receptor Population	Time of Exposure	Exposure Activities	Estimated Potential Number Exposed	Chemicals
Private Wells	Waste pile Contaminated soil	Ground-water	Residents near the site	Ingestion	Residents drinking contaminated well water	Past Present Future	Drinking contaminated well water	75	Table 1

ATTACHMENTS

ATTACHMENT 1

Comparison Values Used In Screening Contaminants For Further Evaluation

Environmental Media Evaluation Guides (EMEGs) are developed for chemicals based on their toxicity, frequency of occurrence at National Priority List (NPL) sites, and potential for human exposure. They are derived to protect the most sensitive populations and are not action levels, but rather comparison values. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Reference Dose Media Evaluation Guides (RMEGs) are another type of comparison value derived to protect the most sensitive populations. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Cancer Risk Evaluation Guides (CREGs) are estimated contaminant concentrations based on a probability of one excess cancer in a million persons exposed to a chemical over a lifetime. These are also very conservative values designed to protect sensitive members of the population.

Maximum Contaminant Levels (MCLs) have been established by USEPA for public water supplies to reduce the chances of adverse health effects from contaminated drinking water. These standards are well below levels for which health effects have been observed and take into account the financial feasibility of achieving specific contaminant levels. These are enforceable limits that public water supplies must meet.

Lifetime Health Advisories for drinking water (LTHAs) have been established by USEPA for drinking water and are the concentration of a chemical in drinking water that is not expected to cause any adverse non-carcinogenic effects over a lifetime of exposure. These are conservative values that incorporate a margin of safety.